

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claim 1 (currently amended): An electron beam irradiation apparatus ~~characterized by~~ comprising:

a rotary driving unit for rotationally driving an object to be rotated;

a shield container for rotatably accommodating the object; and

an electron beam irradiation unit provided in said shield container so that the surface of the object is irradiated with electron beams from an irradiation window thereof,

wherein the surface of the object is irradiated with the electron beams during its rotation from said irradiation window of said electron beam irradiation unit.

Claim 2 (original): An electron beam irradiation apparatus according to claim 1, wherein said electron beam irradiation unit emits the electron beams under a low acceleration voltage.

Claim 3 (currently amended): An electron beam irradiation apparatus according to claim 1 ~~or 2~~, wherein the acceleration voltage of said electron beam irradiation unit is 20 kV through 100 kV.

Claim 4 (currently amended): An electron beam irradiation apparatus according to ~~any one of claims~~ claim 1 through 3, wherein an interior of said shield container is set in an atmosphere of an inert gas, and

said shield container is provided with a gas introduction port and a gas discharge port from which the inert gas flows in the vicinity of said irradiation window.

Claim 5 (original): An electron beam irradiation apparatus according to claim 4, wherein a temperature sensor is provided in the vicinity of said irradiation window, and

irradiation of the electron beams upon the surface of the object.

Claim 11 (original): An electron beam irradiation apparatus according to claim 10, wherein the switchover is conducted so that a quantity of emission of the electron beams is set large when said shutter member is in the opening position and set small when said shutter member is in the closing position.

Claim 12 (currently amended): An electron beam irradiation apparatus according to ~~any one of claims~~ claim 1 through 11, wherein said shield container is openable and closable and is composed of a metallic material, and has a shielding structure for shielding the electron beams emitted from said irradiation window.

Claim 13 (currently amended): An electron beam irradiation method ~~characterized by~~ comprising the steps of:

rotationally driving an object to be rotated accommodated in a shield container that can be air-tightly closed; and

irradiating the surface of said on-rotating object with the electron beams from an irradiation window of an electron beam irradiation unit.

Claim 14 (original): An electron beam irradiation method according to claim 13, wherein said electron beams irradiation unit emits the electron beams of which an acceleration voltage is 20 kV through 100 kV.

Claim 15 (currently amended): An electron beam irradiation method according to claim 13 ~~or 14, further comprising the steps of depressurizing wherein~~ an interior of said shield container is ~~depressurized and is thereafter replaced with~~ replacing in the interior an inert gas atmosphere by introducing an inert gas.

Claim 16 (currently amended): An electron beam irradiation method according to claim 15,

further comprising the step of controlling~~wherein~~ a flow rate of the inert gas ~~is controlled~~ while measuring an oxygen concentration within said shield container.

Claim 17 (currently amended): An electron beam irradiation method according to claim 15 ~~or 16~~, further comprising the step of flowing ~~wherein~~ the inert gas ~~is flowed~~ through the vicinity of said irradiation window toward a gas discharge port from a gas introduction port, thereby cooling off the vicinity of said irradiation window.

Claim 18 (currently amended): An electron beam irradiation method according to claim 17, further comprising the step of adjusting ~~wherein~~ a flow rate of the inert gas ~~is adjusted~~ based on a temperature measured by a temperature sensor provided in the vicinity of said irradiation window, thereby controlling a cooling temperature.

Claim 19 (currently amended): An electron beam irradiation method according to ~~any one of claims~~ claim 13 through 18, wherein the object has a disc shape, and further comprising the step of irradiating on the surface an area, extending in at least one radial direction, on the surface ~~is irradiated~~ with the electron beams.

Claim 20 (currently amended): An electron beam irradiation method according to ~~any one claims~~ claim 13 through 19, wherein the object has the disc shape, and further comprising the step of irradiating each of a plurality of areas with the electron beams with a plurality of electron beam irradiation tubes of said electron beam irradiation unit ~~irradiate each of a plurality of areas with the electron beams~~.

Claim 21 (currently amended): An electron beam irradiation method according to ~~any one claims~~ claim 13 through 20, wherein further comprising the step of moving a shutter member disposed between said irradiation window and the surface of the object ~~is moved~~ between an opening position of permitting transmission of the electron beams emitted from said irradiation window and a closing position of blocking the electron beams, thus controlling switchover of the

irradiation and non-irradiation of the electron beams upon the surface of the object.

Claim 22 (original): An electron beam irradiation method according to claim 21, wherein the switchover is conducted so that a quantity of emission of the electron beams is set large when said shutter member is in the opening position and set small when said shutter member is in the closing position.

Claim 23 (currently amended): An electron beam irradiation apparatus ~~characterized by~~ comprising:

a rotary driving unit for rotationally driving an object to be rotated;
a shield container for rotatably accommodating the object;
an electron beam irradiation unit provided in said shield container so that the surface of the object is irradiated with electron beams from an irradiation window thereof;
a shutter member disposed between said irradiation window and the surface of the object and movable between an opening position of permitting transmission of the electron beams emitted from said irradiation window and a closing position of blocking the electron beams; and
a shutter driving mechanism for moving said shutter member so as to effect switchover to the irradiation and non-irradiation of the electron beams during a rotation of the object,
wherein the object has a disc shape, and an area, extending in a radial direction, on the surface is irradiated with the electron beams from said irradiation window.

Claim 24 (original): An electron beam irradiation apparatus according to claim 23, wherein said electron beam irradiation unit includes a plurality of electron beam irradiation tubes disposed in the radial direction on the surface.

Claim 25 (original): An electron beam irradiation apparatus according to claim 24, wherein said plurality of electron beam irradiation tubes are so arranged as to substantially uniformize a distribution of irradiation beam intensities of the electron beams in the radial direction.

direction, and

the switchover to the irradiation and the non-irradiation of the electron beams is performed by opening and closing said aperture through a movement of said shutter member.

Claim 32 (currently amended): An electron beam irradiation method ~~characterized by~~ comprising the steps of:

~~a step of~~ rotationally driving an object to be rotated accommodated in a shield container that can be air-tightly closed;

~~a step of~~ irradiating the surface of said on-rotating object with the electron beams from an irradiation window by moving a shutter member provided between the surface of the object and said irradiation window of an electron beam irradiation unit; and

~~a step of~~ stopping the irradiation of the electron beams by blocking the electron beams in a way that moves said shutter member after the irradiation of the electron beams for a predetermined period of time.

Claim 33 (original): An electron beam irradiation method according to claim 32, wherein said electron beams irradiation unit has an acceleration voltage ranging from 20 kV to 100 kV.

Claim 34 (currently amended): An electron beam irradiation method according to claim 32 ~~or 33, wherein~~ further comprising the steps of depressurizing an interior of said shield container is ~~depressurized and is thereafter replaced with~~ replacing in the interior an inert gas atmosphere by introducing an inert gas.

Claim 35 (currently amended): An electron beam irradiation method according to claim 34, ~~wherein~~ further comprising the step of flowing the inert gas ~~is flowed~~ through the vicinity of said irradiation window toward a gas discharge port from a gas introduction port, thereby cooling off the vicinity of said irradiation window.

Claim 36 (currently amended): An electron beam irradiation method according to ~~any one~~

an air-tightly closable chamber including: an electron beam irradiation apparatus having a first rotational unit provided in an openable/closable shield container and accommodating and rotationally driving a disc-shaped object, and an electron beam irradiation unit irradiating the surface of said on-rotating disc-shaped object with electron beams from its irradiation window; and an exchange chamber having a second rotational unit capable of accommodating the disc-shaped object and air-tightly closable and openable/closable independently of said shield container; and

a rotary unit for exchanging said first rotational unit in said shield container and said second rotational unit in said exchange chamber with each other by rotating said first rotational unit and said second rotational unit.

Claim 46 (currently amended): An apparatus for manufacturing a disc-shaped object according to claim 44 ~~or 45~~, wherein said electron beam irradiation unit emits the electron beams of which an acceleration voltage is 20 kV through 100 kV.

Claim 47 (currently amended): An apparatus for manufacturing a disc-shaped object according to claim 44, ~~45 or 46~~, wherein the surface of the disc-shaped object moving into said shield container by rotating said second rotational unit in said exchange chamber, is irradiated with the electron beams emitted from said electron beam irradiation unit, and said first rotational unit, accommodating the disc-shaped object after being irradiated with the electron beams, in said shield container is rotated and thus transferred into said exchange chamber.

Claim 48 (currently amended): An apparatus for manufacturing a disc-shaped object according to ~~any one of claims~~ claim 44 ~~through 47~~, wherein said shield container includes a fixed unit forming a first air-tightly closed space in cooperation with said first or second rotational unit and provided with said electron beam irradiation unit, said exchange chamber includes a third rotational unit forming a second air-tightly closed space in cooperation with said second or first rotational unit and capable of attaching and detaching the disc-shaped object,

in a state where said chamber is air-tightly closed, said first rotational unit moves to and

from said fixed unit, and said second rotational unit moves to and from said third rotational unit, thereby exchanging the disc-shaped object,

said third rotational unit opens the second air-tightly closed space and rotates while holding the disc-shaped object, thereby ejecting the post-irradiation disc-shaped object, and

a different fourth rotational unit rotates toward said second rotational unit and exchanges the pre-irradiation disc shaped object in a way that supplies the disc-shaped object to said second rotational unit.

Claim 49 (original): An apparatus for manufacturing a disc-shaped object according to claim 48, wherein said electron beam irradiation unit irradiates the electron beams within said first air-tightly closed space during the exchange of the disc-shaped object by said third and fourth rotational units.

Claim 50 (currently amended): An apparatus for manufacturing a disc-shaped object according to ~~any one of claims~~ claim 44 ~~through 49~~, wherein a shutter member disposed between said irradiation window of said electron beam irradiation unit and the surface of the disc-shaped object and is moved by a shutter driving mechanism between an opening position of permitting transmission of the electron beams emitted from said irradiation window and a closing position of blocking the electron beams, thereby controlling switchover to the irradiation and non-irradiation of the electron beams upon the surface of the disc-shaped object.

Claim 51 (currently amended): An apparatus for manufacturing a disc-shaped object according to ~~any one of claims~~ claim 44 ~~through 50~~, wherein an interior of said exchange chamber is depressurized and is thereafter replaced with an inert gas atmosphere.

Claim 52 (currently amended): An apparatus for manufacturing a disc-shaped object according to ~~any one of claims~~ claim 44 ~~through 51~~, wherein the inert gas flows in the vicinity of said irradiation window, thereby cooling off said irradiation window.

Claim 57 (new): An electron beam irradiation apparatus according to claim 13, wherein an aperture is formed extending in the radial direction, and

the switchover to the irradiation and the non-irradiation of the electron beams is performed by opening and closing said aperture through a movement of said shutter member.

Claim 58 (new): An electron beam irradiation apparatus according to claim 23, wherein an aperture is formed extending in the radial direction, and

the switchover to the irradiation and the non-irradiation of the electron beams is performed by opening and closing said aperture through a movement of said shutter member.

Claim 59 (new): An apparatus for manufacturing a disc-shaped object, comprising an electron beam irradiation apparatus according to claim 23,

wherein at least one of a resin layer and a surface layer formed on the object serving as a disc-shaped object is cured by the irradiation of the electron beams.

Claim 60 (new): A method of manufacturing a disc-shaped object, involving the use an electron beam irradiation method according to claim 32,

further comprising the steps of forming at least one of a resin layer and a surface layer on the object serving as a disc-shaped object; and curing by the irradiation of the electron beams.

Claim 61 (new): An apparatus for manufacturing a disc-shaped object according to claim 45, wherein said electron beam irradiation unit emits the electron beams of which an acceleration voltage is 20 kV through 100 kV.

Claim 62 (new): An apparatus for manufacturing a disc-shaped object according to claim 45, wherein the surface of the disc-shaped object moving into said shield container by rotating said second rotational unit in said exchange chamber, is irradiated with the electron beams emitted from said electron beam irradiation unit, and

said first rotational unit, accommodating the disc-shaped object after being irradiated with the electron beams, in said shield container is rotated and thus transferred into said exchange chamber.

Claim 63 (new): An apparatus for manufacturing a disc-shaped object according to claim 45, wherein said shield container includes a fixed unit forming a first air-tightly closed space in cooperation with said first or second rotational unit and provided with said electron beam irradiation unit,

said exchange chamber includes a third rotational unit forming a second air-tightly closed space in cooperation with said second or first rotational unit and capable of attaching and detaching the disc-shaped object,

in a state where said chamber is air-tightly closed, said first rotational unit moves to and from said fixed unit, and said second rotational unit moves to and from said third rotational unit, thereby exchanging the disc-shaped object,

said third rotational unit opens the second air-tightly closed space and rotates while holding the disc-shaped object, thereby ejecting the post-irradiation disc-shaped object, and

a different fourth rotational unit rotates toward said second rotational unit and exchanges the pre-irradiation disc shaped object in a way that supplies the disc-shaped object to said second rotational unit.

Claim 64 (new): An apparatus for manufacturing a disc-shaped object according to claim 45, wherein a shutter member disposed between said irradiation window of said electron beam irradiation unit and the surface of the disc-shaped object and is moved by a shutter driving mechanism between an opening position of permitting transmission of the electron beams emitted from said irradiation window and a closing position of blocking the electron beams, thereby controlling switchover to the irradiation and non-irradiation of the electron beams upon the surface of the disc-shaped object.

Claim 65 (new): An apparatus for manufacturing a disc-shaped object according to claim 45, wherein an interior of said exchange chamber is depressurized and is thereafter replaced with an

